REMARKS

The above claim amendments are submitted with the following remarks to be fully responsive to the Official Action dated August 17, 2004. It is further submitted that this response is timely filed within the three-month shortened-statutory period. Accordingly, no fee for an extension of time is believed necessary. Should any additional fee be required, the Commissioner is authorized to charge Kagan Binder Deposit Account No. 50-1775 and thereafter notify us of the same. Reconsideration of all outstanding grounds of the rejection and allowance of the subject application are believed in order and respectfully requested.

Election/Restrictions

In the Official Action, the Examiner has required restriction under 35 U.S.C. §121 to one of the following groups of claims:

I. Claims 1-14, and 25, drawn to a method of processing a semiconductor, classified in class 134, subclass 26; and

II. Claims 15-24, drawn to a method of controlling the charge, classified in class 361, subclass 230.

Applicants hereby confirm the provisional election made by Kevin Hubbard on August 11, 2004 to prosecute the invention of embodiment 1, claims 1, 2, and 10-18. Additionally, please cancel claims 15-24 at this time.

Claim Rejections—35 USC § 112

Claims 6 and 14 stand rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. In particular, the Official Action asserts that claim 6 is indefinite because it is unclear whether the drying enhancement substance is the same or different from the antistatic agent.

Applicants submit that claim 6 meets the requirements of 35 USC § 112, second paragraph. Claim 1 recites a step of drying one or more wafers in the presence of an antistatic agent. Claim 6 further limits claim 1 by reciting a distinct step of introducing a

drying enhancement substance into the process chamber. The drying enhancement substance is a separate ingredient that is introduced into the process. As such, claim 6 meets the requirements of 35 USC § 112, second paragraph. Withdrawal of the rejection of record of claim 6 is therefore respectfully requested.

Regarding claim 14, the Official Action asserts that claim 14 is indefinite because it is unclear how you can rinse with an ionized gas. By this amendment claim 14 is amended to depend from independent claim 11. Claim 14 thus recites that the gaseous antistatic agent that is present during at least a portion of the rinsing step as recited in claim 11 comprises ionized clean dry air.

Withdrawal of the rejection of record of claim 14 is therefore respectfully requested.

Claim Rejections—35 USC §102

Claims 1-3, 6, 8-12, and 25 stand rejected under 35 USC § 102(b) as being anticipated by US Patent No. 4,132,567 to Blackwood. The Official Action asserts that Blackwood teaches cleaning of wafers in a processing chamber followed by drying with ionized nitrogen gas to eliminate static electric charge from the wafer. In particular, the Examiner views ionized nitrogen as an antistatic agent as recited in claims 1-3, 6, 8-12, and 25. This rejection is traversed because ionized nitrogen is not an antistatic agent in accordance with the present invention. Therefore, Blackwood cannot anticipate claims 1-3, 6, 8-12, and 25.

Blackwood cannot anticipate claims 1-3, 6, 8-12, and 25 because Blackwood does not teach or disclose an antistatic agent as recited by claims 1-3, 6, 8-12, and 25 and as defined in the specification. Although Blackwood describes the use of ionized nitrogen, ionized nitrogen is not an antistatic agent in accordance with claims 1-3, 8-12, and 25. The present specification empirically defines how to determine whether a material is an antistatic agent at page 11, line 29 through page 12, line 28 in terms of the ability of the material to protect against charge buildup. Although Blackwood describes the use of ionized nitrogen, ionized nitrogen, as expressly stated in the present specification, fails to qualify as an antistatic agent according to this definition. This definition explains that one or more wafers are processed according to a process recipe comprising at least one

rinse step and at least one dry step. In a first run, the gas under consideration is not introduced into the process chamber in any rinse or drying step. Charge buildup, C1, on the wafer(s) at the end of the recipe is then measured and an average is determined. Meanwhile, in a second run, the same process is carried out except that the gas under consideration is introduced for the purposes of this testing into the process chamber during rinsing and drying. To carry out the test, the candidate gas is introduced into the chamber in admixture with N_2 carrier gas at a concentration such that the weight ratio of the carrier gas to candidate gas is about 60:1. Charge build up, C2, on the wafer(s) at the end of the recipe is then measured and an average is determined. The candidate gas will be deemed to be an antistatic agent if the ratio given by C1/C2 (average values) is less than about 0.25, more preferably less than about 0.1, and more preferably less than about 0.01. More preferably, a gas will be deemed to be an antistatic agent if the average value of C2 is less than about -1.0 kV, more preferably less than about -0.1 kV.

Under this preferred definition, neither nitrogen nor ionized nitrogen is an antistatic agent, whereas each of ionized clean dry air, non-ionized carbon dioxide, and ionized carbon is an antistatic agent (see page 12, lines 16-18). The present specification explains that nitrogen gas has minimal ability to control charging and that ionized nitrogen is not much better than non-ionized nitrogen (see page 12, lines 18-20). Moreover, data is provided in the present specification that shows using ionized nitrogen limited charging only from about -12kV down to not less than about -7 kV (see page 12, lines 20-23).

Accordingly, such substances are not considered to be an antistatic agent in accordance with the present invention. Therefore, because ionized nitrogen gas is not an antistatic agent as recited in claims 1-3, 6, 8-12, and 25, Blackwood cannot anticipate these claims. Withdrawal of the rejection of record is respectfully requested.

Claim Rejections—35 USC §103

Claims 4 and 13 stand rejected under 35 USC § 103(a) as being unpatentable over US Patent No. 4,132,567 to Blackwood in view of US Patent Application Publication No. 2003/0013310 to Tomimori et al.

The Official Action asserts that it would have been obvious in view of Tomimori et al. to use carbon dioxide as an antistatic agent in the drying process of Blackwood for purposes of decreasing the electrostatic charge on the wafer surface. The rejection is traversed because, although Tomimori et al. might teach that an aqueous antistatic agent might be beneficial in a wet, aqueous treatment, Tomimori et al. does not teach, suggest, or provide any reason to use any antistatic agent at all during a drying process. Moreover, Tomimori et al. does not recognize that gaseous carbon dioxide can provide an antistatic function during a drying process. Tomimori et al. only suggests the use of gaseous carbon dioxide for providing a drying function during a drying step.

The problem that the Tomimori et al. reference sets out to solve is that when a semiconductor wafer is cleaned with deionized water, the destruction of thin dielectric layers, such as gate oxide films, occurs at the central portion of the wafer. Specifically, deionized water is a highly resistive material. As a result, when cleaning the surface of the wafer with deionized water, friction that exists between deionized water and the wafer produces static electricity due to the relative motion between the deionized water and the wafer. Particularly, because the centrifugal force acting on deionized water near the center of rotation of the wafer is weaker than that on the periphery of the wafer, deionized water supplied around the center of rotation of the wafer stays on the surface longer than that supplied to the periphery of the wafer. Electric charge produced through frictional contact of deionized water and the wafer thus generates locally around the center of rotation of the wafer. Therefore, the wafer becomes negatively charged more significantly on the central portion than on the peripheral portion.

As a solution to this problem, Tomimori et al. provides a method where deionized water is ejected toward the point off the center of rotation of the wafer so that the deionized water is prevented from stagnating over the central portion of the wafer, thereby avoiding the generating of electric charge there. In the specific context of wet processing in this manner, Tomimori et al. teaches one embodiment where carbon dioxide can be used to reduce the specific resistance of deionized water. By reducing the specific resistance of the deionized water, along with ejecting the deionized water near the center of rotation of the wafer, charge buildup during this specific type of wet processing can be reduced.

In short, Tomimori et al. teaches that wet processing leads to charge buildup and that aqueous carbon dioxide can function as an antistatic agent in an aqueous solution. This aspect of Tomimori et al. has nothing to do with drying. True, Tomimori et al. also teaches a drying process. However, Tomimori et al. does not identify any concerns related to charge buildup or charge control during a drying process. The entire focus of Tomimori et al. is on charge control during wet processing. Indeed, Tomimori et al. does not provide any need or desire or any suggestion whatsoever to provide any antistatic function as part of a drying step. All that Tomimori et al. teaches in the context of a drying process is that nitrogen or carbon dioxide can be used for drying. According to the teaching of Tomimori et al., therefore, nitrogen and carbon dioxide are functionally equivalent as drying agents. As such, Tomimori et al. fails to recognize the need for an antistatic function in a drying process and additionally fails to recognize that carbon dioxide could provide such an antistatic function. If one skilled in the art follows the teaching of Tomimori et al., nitrogen and carbon dioxide are functionally equivalent. Therefore, following the teaching of Tomimori et al. fails to necessarily lead one of skill in the art to use carbon dioxide as an antistatic agent in a drying process. (See Continental Can Company USA, Inc. v. Monsanto Co., 20 USPQ2d 1746 (Fed. Cir. 1991), Glaxo Inc, v. Novopharm Ltd., 34 USPQ2d 1565 (Fed. Cir. 1995), *cert. denied*, and Scaltech Inc. v. Retec/Tetra, L.L.C., 51 USPQ2d (Fed. Cir. 1999), *revising*, 48 USPQ2d 1037 (Fed. Cir. 1998).

Accordingly, the substitution of carbon dioxide as taught by Tomimori et al. for the ionized nitrogen of Blackwood is unsupportable and the rejection is improper. Withdrawal of the rejection of record of claims 4 and 13 is therefore respectfully requested.

Claims 5 and 14 stand rejected under 35 USC § 103(a) as being unpatentable over US Patent No. 4,132,567 to Blackwood in view of US Patent Application Publication No. 2002/0045328 to Kobayashi et al.

The Official Action asserts that it would have been obvious to a person of ordinary skill in the art to modify the method of Blackwood to include using ionized air as taught by Kobayashi et al. for purposes of performing the same function of decreasing

the electrostatic charge on the wafer surface. Applicants respectfully disagree with this assertion and traverse the rejection.

Claims 5 and 14 recite the use of an antistatic agent comprising clean dry air as part of a drying step. The Kobayashi et al. reference provided no teaching, motivation, or suggestion to use clean dry air in a drying step because the Kobayashi et al. reference does not have or suggest a drying step. The Kobayashi et al. apparatus provides a treatment section that performs a dry etching or plasma process on semiconductor wafers in a vacuum (see paragraph 203). The apparatus also includes an ionizer for ionizing ambient air (see paragraph 205) for eliminating static charges on the semiconductor wafers before the wafers are introduced into the treatment section. The ionizer is providing in a transport or staging section of the apparatus.

Kobayashi et al. does not disclose or suggest in any way any drying step because vacuum processing and wet processing are distinct. In fact, there is no mention of any type of wet processing whatsoever in the Kobayashi et al. reference. Moreover, Kobayashi et al. fails to teach, motivate, or suggest that any substance or process used in vacuum processing could be used in wet processing. As such, one of ordinary skill in the art would not have any reason to modify Blackwood as based on Kobayashi et al. Blackwood is directed to wet processing while Kobayashi et al. is directed to vacuum processing. Accordingly, the combination of Blackwood and Kobayashi et al. is improper and withdrawal of the rejection of record is respectfully requested.

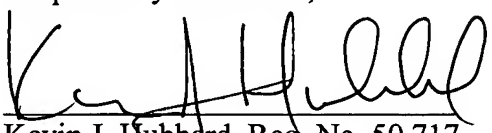
Claim 7 stands rejected under 35 USC § 103(a) as being unpatentable over US Patent No. 4,132,567 to Blackwood in view of US Patent No. 4,132,567 to Tamaki et al.

As described above, claim 1 is believed patentable as originally filed. Accordingly, claim 7 is believed patentable at least because claim 7 further limits claim 1. Accordingly, withdrawal of the rejection of record is respectfully requested.

The Examiner is invited to contact the undersigned, at the Examiner's convenience, should the Examiner have any questions regarding this communication or the present patent application.

Dated: November 17, 2004

Respectfully Submitted,

By: 

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